1: Conzemius M-4, 5 (1921) 1932
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mangroves, reeds, and coarse grasses. Then follows the real tropical forest with very fertile soil, consisting on the surface of vegetable humus. In order to penetrate the forest the hunter has to cut his way through the tangled mass of vines and epiphytes with the aid of his machete.

North of Rio Patuca the fertile areas are characterized by the existence of extensive "cohune ridges," that is, places dotted with the cohune or corozo palm (*Attalea* sp.). A great number of other palms are found in this region, but only two of them are cultivated and play an important part in the food supply, the coco palm and the pejivalle. Among the other tree forms characteristic of the forest may be mentioned the following: Ceiba (*Ceiba pentandra* Gaertn.), mahogany (*Swietenia macrophylla* King), Spanish or West Indian cedar (*Cedrela* sp.), rosewood, rubber tree (*Castilla* sp.), sapodilla (*Sapota zapotilla*), lignum vitae or guayacán (*Tecoma* sp.), Santa Maria or calaba (*Calophyllum brasiliense* var.), and balsa or corkwood (*Ochroma lagopus*). Epiphytic orchids are especially numerous and rare varieties are also found. The strong withes or *bejucos* on the trees are used in basketry and as a tying material.

From Rio Tinto to Rio Grande the dense forest is at times interrupted by large areas of pine ridges or savannas. These are undulating plains covered with gravel or coarse sand, overgrown with grass, myrtaceae, oaks, nances, small fan palms and long leaf or pitch pines. This pine (*Pinus tenuifolia* Benth.) has its southern limit on the Atlantic side of Nicaragua, a little north of Bluefields Bluff, in latitude 12° 5′ north. Few big trees are to be found in these savannas; there is little underbrush, epiphytes and lianas are scarce, and the whole presents a parklike appearance. On the rich alluvial soil on both sides of the streams traversing the savannas grows a dense and luxuriant vegetation resembling the real forest.

ANIMAL KINGDOM.—Zoologically the Mosquito Coast belongs to South America rather than to North America. In this sparsely inhabited region may be found a great number of species of animal life. The largest mammals are the tapir and the manatee; the latter is still an important animal of food for the Indians, but it is getting rare now.

In the jungle are found such beasts of prey as the jaguar, the puma or cougar, and the ocelot; a black variety of the jaguar is occasionally met with. The howling monkey, the spider monkey, and the white-faced or capuchin monkey are found on the tree tops; the two last-named ones are, together with two species of deer and two species of peccary, the most important food animals of the Indians.

Three species of anteaters, many armadillos and opossums, and 2-toed and 3-toed sloths may be met with. Among the rodents may be mentioned the agouti, paca, several species of porcupine, squirrels,

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and rabbits. The raccoon, the coati or pisote, the weasel, the skunk, and the kinkajou are met with in the forests and the otter exists in all the streams.

Alligators and a small species of crocodile infest the rivers, lagoons, and swamps. Several varieties of river turtles or tortoises occur, while the valued hawk's bill, the green turtle, and the loggerhead are caught in the sea. The largest lizards are the iguanas, which occur in several eatable varieties. Poisonous and harmless snakes are numerous.

Man-eating sharks and sawfishes are found in the sea and in the lower course of the streams.

The "john crow" or turkey buzzard is a useful scavenger. During the winter months many of the common North American birds arrive as immigrants and spend the cold season in this mild climate. Guans, curassows, mountain hens, wild ducks, and pigeons are esteemed as food. Trogons, orioles, toucans, tanagers, macaws, parrots, parrakeets, and humming birds make themselves conspicuous by their plumage or by their song. Flamingos, white egrets, and herons are found chiefly around the lagoons and swamps.

The mosquitoes are the propagators of malaria, while red bugs, ticks, cockroaches, jiggers, sandflies, and screw worms are largely responsible for the prevailing skin troubles.

INHABITANTS.—The humid tropical climate, combined with the jungle vegetation, have retarded settlement and the building up of a dense population. The bulk of the inhabitants of the Mosquito Coast are found along the seashore and on the lower part of the larger rivers.

Besides the *Miskito* and *Sumu*, with whom the present monograph will deal, two other Indian tribes inhabit the Mosquito Coast, the *Paya* and *Rama*. The former live in Honduras between Rio Patuca and Rio Sico. Their number is estimated at about 700 and they are dying out rapidly (vide Conzemius, b). The Rama tribe, the bulk of which lives on Rama Key in Bluefields Lagoon, numbers only about 200. Its language is of Chibcha stock and is closely allied to those spoken by the aborigines of Costa Rica, Panama, Colombia, and northern Ecuador (vide Conzemius, c). The western portion of the Mosquito Coast was formerly occupied by the *Matagalpa*, whose language has been extinct for nearly half a century; a dialect of it is still spoken to this day in the villages of Cacaopera and Lislique (Salvador). A number of other tribes have been reported from the country under consideration in former days, but as they have been extinct for some time it has been impossible to classify them. Some of the tribal designations applied by the early authors are merely derived from the rivers upon which the tribes lived.

From Rio Tinto northward along the sea and lagoons live the so-called *Black Carib* or *Garif*. These are the descendants of the

3: Pijoan D-5 (ca. 1945) 1946
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The solution of ethnological problems by the helminthological approach is not without its difficulties and as such is beyond the scope of this report. On the basis of Sandground's data the prevailing hookworm infection among pure blooded Indians should be *Ancylostoma duodenale* but where Negroes have settled and intermingled the infestation becomes dominantly *Necator americanus*. In the Coco Basis, where hookworms were introduced primarily by negroes, the infestation, as far as our observations permitted, was that of *N. americanus*.

It is of interest to note that onchocerciasis was not found in the Coco Basin even though the writer thought he had found two patients with this disease. The biopsy material was poorly prepared and there was some question as to the identity of the filarial worms. That the diagnosis was probably erroneous was further strengthened by the fact that *Simulium* flies transmitting this disease were not seen. However, the limited observations in searching for the fly were by no means thorough and do not exclude the possibility of their existence or that of the disease. It may be that in years to come when commerce between natives is increased the appearance of onchocerciasis may become an obvious clinical finding.

Cases of Schistosomiasis have been reported from Panama, Costa Rica and Yucatán but none have been reported from Guatemala[70] nor were we able to find any in Central Nicaragua. Even though *S. mansoni* and *S. hematobium* are of Ethiopian origin, the appearance of negroes in the Coco Basin did not introduce the disease and this fact is ascribed to the absence of the species of snails suitable for the larval development of the parasite.

The commonest worm infestations in the Indians of the Coco Basin were *Ascaris lumbricoides* and *Trichuris trichiura*. The former was common in communities which do not possess sanitary facilities and is contracted by ingesting eggs that are expelled in the feces. The latter, "whip worms", whose eggs are able to withstand adverse environmental conditions, almost to the same extent as those of Ascaris, was commoner than the former and the "pinworm" *Enterobius vermicularis* was frequently found. *T. saginata* and *T. solium* have been noted by others in the area studied but were not observed by us.

[70] Sandground, J. H. Helminthic infections in Guatemala in a Medical Survey of Guatemala, Carnegie Institution of Washington, 1938.

3: Pijoan D-5 (ca. 1945) 1946
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The mosquito, *Aedes aegypti*, the transmitter of the disease, is common in the territory but is apparently uninfected. Even in the listing of Hirsch there is no report of yellow fever in Nicaragua until 1868 and it is possible for geographical reasons that the disease failed to appear in the Coco Basin. According to Raynal[73] several outbreaks of yellow fever occured in nearby Guatemala (San José, 1859; Escuintla, 1868; Retalhuleu, 1881 and 1895), and this would confirm Hirsch's notation of yellow fever in Nicaragua in 1868.

It must be recalled that a high mortality occurs from yellow fever only when the disease appears in a relatively non-immune population or when the disease has been carried to immune territories. It is possible therefore that the disease, if present at one time, could be quiescent in certain areas for a period of years and since small numbers of travellers visit central and eastern Nicaragua, very few, if any, infective people enter the territory. With this in mind it would appear plausible to suppose that the vector insect has not had opportunity for obtaining the virus.

Plague

Although common in Europe during the 16th and 17th centuries, plague did not reach the New World until late in the 19th century, when it appeared for the first time in San Francisco, México, and other scattered territories. Plague is unknown in the Coco Basin and as a result presents no public health problem.

Cholera

The first pandemic of cholera probably started in Indian between 1817 and 1823 but did not reach the New World until between 1826 and 1837.[73] In 1837, according to Bancroft[74] the epidemics of cholera began to make their appearance through Guatemala and in other parts of Central America; in Nicaragua in 1855 it became a serious problem. In 1856 it crippled Mora's army in Nicaragua and continued its course. Walker's army was devastated by it.[74] The disease spread quickly throughout Central America and continued in El Salvador and Guatemala until near the end of 1857. It broke out again in Nicaragua in 1866 and continued in Honduras until 1871. In spite of the poor sanitary conditions today the presence of the disease has apparently

[73] Raynal, J. Annales de médicine et de pharmacie coloniales. 1932, *30*, 59, Paris.

[74] Bancroft, H. H. History of Central America, 1883, 1887, vols. 7 and 8. San Francisco.

3: Pijoan D-5 (ca. 1945) 1946
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Combined results of the malarial survey at Saulpaca (Zapuca) and San Carlos

Age	*Total N° of Persons*	*Spleen examination Positive Splenomegaly*		*Positive Blood smear for parasites*	
Years		*Saulpaca*	*San Carlos*	*Saulpaca*	*San Carlos*
0-1	40	0	11	6	10
2-4	46	2	15	13	17
5-9	128	3	52	46	55
10-14	80	2	34	27	36
15-19	41	2	18	14	20
50-54	34	0	8	8	9

the proximity of Bilwas Karma where certain public health measures have been introduced to expect a decreased incidence of disease. However the problem of clinical malaria remains a challenge and suppressive measures with atabrine or similar drugs may do much for these communities; the use of effective insect control with modern insecticides may play a major role in the future village control of insect borne disease. From the values given in the examination for malaria it is obvious that the disease constitutes the mayor health problem of the area. At Waspam, Bilwas Karma, the following mosquitoes were collected by our party, these were: *Anopheles albimanus, A. albitarsis, A. aquasalis, A. argyritaris, A. parapunctipennis, A. pseudopunctipennis,* (several varieties), *A. vestitipennis, and A. crucians* (reported to be collected by Kumm). *A. albimanus* was found in great numbers and is probably the principal transmitter of malaria. This species is found in humid tropical climates and its breeding places are in the swamps exposed to the sun. However it has been known to exist at altitudes of 1350 meters (Guatemala City) and is the most common vector.

Syphilis

Hrdlicka[69] has pointed out that there is no substantial evidence of precolumbian syphilis. On the other hand Williams and Wakefield. Dellinger and Camp[70] regard the conclusions of their studies as being sufficient to substantiate the view that syphilis was endemic in North America prior to European contacts. Regardless of controversy, sy-

[69] Hrdlicka, A. Disease, medicine and surgery among American aborigines (Geo. M. Kober Lecture). Jour. Amer. Med. Assoc. 1932, 99, 1661.

[70] Wakefield, E. G. Dellinger, S. C. and Camp, J. D., Study of osseous remains of "mound builders" of eastern Arkansas. Amer. Jour. Med. Sciences, 1937, 193, 448.

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pre-columbian origin. The disease was found to occur in 10 per cent of the population examined, some villages having more of the disease than others. Aside from discoloration of the skin no other symptoms could be found and it appeared to have little effect on the body economy of an individual. However, many persons were conscious of the discoloration, felt shy because of it and presumed themselves to be unclean. The disease was common in certain families and not in others though there seems to be no evidence for congenital transmission[99]. So far little or no treatment for the disease has taken place in this area.

Dysentery

If by dysentery we mean infectious diarrhea then this disease is not only prevalent in the tropics but it is associated by high morbidity and mortality. And since it is epidemic in quality it is bacterial in origin.* However it must not be forgotten that dysentery is a loose term denoting mainly a symptom complex. As such the disease can be caused by amoeba, by the ciliate *Balantidium coli*, by malaria (P. falciparum), by certain worms, and by *giardia*. The two most common types of dysentery are bacillary and amoebic and of these two the former is our primary concern.

Bacillary dysentery is common throughout the year in the Coco River basin but has its greatest epidemic quality during the beginning and end of the rainy seasons. The childhood mortality rate from the disease although not exact takes a toll of approximately ten per cent of the children afflicted by it. As far as could de determined with limited equipment the common etiological agent is *Shigella paradysenteriae Flexner*, an organism utilizing glucose, mannite, but not lactose or dulcite.

The disease occurs chiefly in the larger villages; in the smaller villages it may be rare or have never occured. This is of interest from an epidemiological point of view since in some of the isolated small villages the carrier or the source of the organism is not available. In the larger villages, an example of which is San Carlos, the disease may debilitate a third to one half the population. In our opinion, at San Carlos the disease may be traced to certain wretched latrines within the business section of the village. Some of the latrines have been erected at considerable cost; others are make-shift devices for the conveniences of their owners. Regardless of cost the screens because

[99] Mackie, T. T., Hunter, G. W. and Worth, C. B. A. Manual of tropical medicine. Philadelphia. 1945.

* Dysentery bacilli, Salmonella, Staphylococci, etc.